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# ELECTROLYSIS IN THE TREATMENT OF NÆVUS.

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As the practitioner is very frequently called upon to treat cases of nævus, and electrolysis properly employed offers greater advantages than any other form of treatment in the majority of cases, I have chosen for the theme of my paper the use of electrolysis in the treatment of nævus. I shall not attempt to consider the matter in an exhaustive manner, but it is necessary to make some observations of a preliminary nature before proceeding to consider in an intelligent way the treatment advocated. Under the term "Nævus" are embraced many deviations from the normal condition, of dissimilar structure and characteristics; perhaps, the classification of Van Harlingen is as free from objection as any, and his definitions also are commendable. As regards the skin, Van Harlingen seems to recognize two chief divisions—nævus vasculosis, nævus flammeus, a congenital new-growth of the vessels of the skin; and nævus pigmentosus, nævus spilus, nævus verrucosus, nævus lipomatodes, and nævus pilosus, a group of hypertrophies of the pigment, with or without the involvement of other elements of the skin. He also alludes to nævus papillaris, nævus unius lateris, and nerve nævus, but these we shall not consider.

Of nævus pigmentosus, or pigmentary mole, Van Harlingen says it "may consist simply of a circumscribed pigmentary deposit in the skin, without hypertrophy of the connective-tissue elements or of the hairy system; or in addition to the excess of pigment there may be hypertrophy of all the cutaneous structures, especially the hair. When smooth on the surface and level, or nearly so, with the skin they have been called nævus spilus. When rough, uneven, and warty, they are called nævus verrucosus. Sometimes they are met with as thick, soft connective-tissue growths of variable dimensions, being then designated nævus lipomatodes. Sometimes pigmentary nævi are smooth and hairless, at other times they are more or less covered with hair. The smaller moles are often acquired, while larger hairy nævi are congenital." The same authority defines nævus vasculosus thus: "Vascular nævi are congenital formations composed chiefly of blood-vessels, which have their seat in the skin and subcutaneous tissues. They may be prominent, turgescent, erectile, or even pulsating, tumor-like growths (angioma cavernosum, tumeur érectile), or they may be flat, non-elevated, well-defined or faint, smooth patches (nævus simplex). The latter is the 'mother's mark' or 'port-wine mark' of popular language. Angioma cavernosum is, in reality, rather a tumor of the deeper tissues than a disease of the skin. The superficial form of vascular nævus may be either congenital or acquired. The latter variety will be described under the head of Telangiectasis." The foregoing descriptions exhibit discrepancies, due perhaps to haste in the preparation of

the article ("Nævus," in the "Reference Handbook of the Medical Sciences"); otherwise they are much clearer than the bulk of literature on the subject, and the classification given is the one to which I shall adhere in my paper.

Quain, in speaking of capillary angiomas says: "Microscopically, a nævus is composed of large capillaries, amongst which are seen arterial and venous trunks of larger size. Between the vessels are found connective tissue or fat, and sometimes the special constituents of the skin, such as sweat or sebaceous glands. It must be remembered that the nævus element enters rather largely into the composition of some other tumors, and notably of congenital moles (benignant melanoses)," and again, "Microscopically a cavernous angioma presents fibrous trabeculæ, lined with the characteristic vascular endothelium, and in parts, perhaps separated by layers of alveolar or any other tissue which the tumor may be involving." Quain uses teleangiectasis as a synonym of angioma.

In the supplement to Ashurst's International Encyclopædia of Surgery, under the article "Tumors Angioma," we read "Gessler collected 1,178 cases of tumors of the blood-vessels, and found that seventy-six per cent. occurred on the head, eleven per cent. on the trunk, nine per cent. on the extremities, and three per cent. on the back. The disease is congenital in nearly all cases. He also found that it was more than twice as common in the female as in the male. (2.4)" Wyeth says, "The arterial and capillary cutaneous tumors are almost always congenital; the venous tumors are rarely so."

Of the forms of vascular nævus, the capillary is the most frequent, and the venous the least so. The different forms of nævi vary greatly as to color, size, shape and number; the pigmentary form may be of any shade from light fawn to jet black, in size from a pin head to a foetal head; as a rule the smaller, the more regular is their outline, they may be single or multiple, covering the skin with hundreds of spots in reported cases; the vascular variety may be any color from the faintest blush to the deepest purple, from the size of a pin point to the extent of an extremity, or even half the body, in punctate spots, as a tortuous vessel barely below the surface, as a stain, or in the form of small tumors. Hutchinson reports a case of a child which had over one hundred nævi, all distinct and superficial.

Again I quote from Van Harlingen: "As regards the cause of nævus, the explanation given by Virchow, namely, superfluous vascular formations in those portions of the embryo at which junction of the various parts takes place, seems most plausible. A small quantity of matter left over, squeezed out between the joints, as it were, like superfluous building material, forms these nævi and the similar growths of lymphatics, hair, pigment, etc." Nævi frequently disappear spontaneously in the early months, or perhaps years of childhood; they also frequently remain in a stationary condition, but they quite as frequently grow very rapidly, both in size and extent; they are generally benign, but often cause serious inconvenience and great disfigurement. Wyeth says, "Moles, whether simple, hairy, or pigmented, are benign. As a result of irritation they may inflame and become ulcerated, or may develop into malignant growths. Carcinomata, especially of the melanotic variety, are frequently described as having resulted from inflamed pigment moles. Alarming hæmorrhage has been known to occur from a mole more than usually vascular, in which ulceration has been established by friction of the clothing." And again: "J. Müller has reported a malignant (recurrent) angioma. A case of melanotic degeneration of a congenital nævus in a woman, aged forty, has been reported by Dr. Stiles." James Nevis Hyde, in Hare's "Therapeutics," remarks: "In managing all such pigment anomalies one should never forget that there is always a scar left after



removal of the disfiguring patch, and that, as in the case of warts, when treated after the fortieth year of life they may be followed by epitheliomatous or sarcomatous metamorphosis." The vascular nævi are also liable to undergo cystic degeneration, as well as ulcerative and suppurative, and may undergo spontaneous cure by ulceration, or by thrombosis; the fact that inflammation of a nævus generally leads to a cure, very naturally suggests that the work of nature should be imitated in the treatment of this condition; and most of the efforts of the practitioner have been along these lines, namely, the creation of an inflammatory process by an irritant introduced locally, or in some cases merely applied to the surface. As to any interference whatever, in the case of nævus, I think that the wisest course to pursue is this: When consulted as to the advisability of treatment, particularly in a very young child, it is well to keep the case under very careful observation for a few months; if the nævus should exhibit a tendency towards spontaneous involution in this time, interference may be unnecessary; if, on the other hand, it should exhibit a tendency to spread, immediate recourse should be had to some means to check or remove the growth, and first on the list, as a rule, I place electrolysis, *properly employed*. I advise early operation for several reasons, the case is more amenable to treatment than when the tissues are more matured, the operation is less prolonged, repetition of the operation may be avoided thereby, it will not be necessary to destroy as much tissue, the danger of sloughing and disfiguring cicatrices is much less, for milder currents may be employed with advantage, also if a scar should perchance result, it will be more apt to disappear as the child grows. These are some of the chief reasons why I advocate early treatment, if the other conditions are favorable. When catarrhal conditions of the mucous membranes are present, or where the skin is in an irritable condition or an eruption is present, it will be very unwise to proceed, and these conditions must receive attention before the operation is had recourse to, or healing will be retarded and suppuration set up and prolonged. The better the health of the child the more successful the result.

I will not attempt to enter fully into the chemistry of electrolysis, interesting though that phase of the subject is, but may be permitted to remind you that electrolysis carried to its limit means decomposition, though it means much more than that. The decomposition of electrolysis is also much more rapid than that of nature, and much more under our control. If two needles of a material which will not be attacked by the current or its products, are connected, the one with the positive, the other with the negative pole of a battery, and each thrust into a piece of meat, and the current turned on, a visible change in the tissue follows very shortly, bubbles of gas are seen around each needle, less numerous about the positive than the negative, provided the tissue is moist, for the presence of water is necessary for the process, and the more moist is tissue the better will it conduct the current, and the more readily will it be decomposed. After a short time it will be found that the zone of tissue about the positive pole is drier than that about the negative, and other changes are apparent. But besides these it will be found, upon applying the proper tests, that the gases are of a different nature, that collecting about the positive pole being oxygen, while that about the negative is hydrogen; in addition it will be found that at the needle connected with the positive pole are the *acid* constituents of the compound salts of the tissue, while at the negative are the *alkaline or basic* constituents. As may be surmised from this the therapeutic effects of the two poles are dissimilar in many respects. Without stopping to give the reasons, I shall merely say in passing that where the positive pole is employed in puncture that it will have the action

of an acid escharotic, while the negative will have the action of an alkaline escharotic. The cicatrix resulting from a positive puncture is firmer than that due to a negative puncture, is more liable to retract; that from the negative is more plentifully supplied with vessels, softer, more apt to disappear.

The indications for the use of the respective poles are briefly as follows: Where you wish to promote absorption, or to block up the capillaries, and thereby cause atrophy, or where a scar is to be particularly avoided, if possible, the negative pole is employed. Where you wish to remove redundant tissue, or to cause an artificial thrombosis, the positive pole is generally used.

A detailed description of the requisite apparatus is unnecessary; of course, the galvanic or continuous current is the one to employ, and everything must be in perfect order, some means must be provided for turning on, increasing and decreasing the current without shock to the patient; a meter to measure the current strength is absolutely necessary, and your fine needles must be suitably insulated and of the proper material. Where it is desired to employ the positive pole you must never use a needle of steel, or you will probably leave an indelible stain as a memento of your experiment. An alloy of iridium with platinum is the most usual material in these cases; with the negative pole the needle may be of steel.

Sometimes both needles are inserted in the tissue to be acted upon, this is called the bipolar method; in other cases one needle is inserted and the circuit is completed by an electrode held in the hand in the case of adults, and placed upon the back; usually in the case of children, this is called the monopolar method; the needle is generally termed the active electrode, the one by which the circuit is completed is termed the indifferent electrode. The inactive or indifferent electrode may be made of brass wire gauze, covered on its face with a layer of absorbent felt, and with a backing of sheet rubber, which serves the purpose of protecting the clothing from moisture, and also insulates the electrode on the surface which might come in contact with parts which it is not desirable that it should touch; this indifferent electrode should be thoroughly wet with warm water before applying and the superfluous moisture squeezed out. In the case of infants and young children I consider it advisable to operate under an anæsthetic, not so much on account of the actual pain of the procedure, but in order that the parts may be in as quiet a condition as possible; a sudden movement of the child might start a troublesome hæmorrhage, which might undo much of your work; undue crying might also act in the same way. In the case of an adult I rarely employ an anæsthetic, unless occasionally in the region of the eyelid, nose or some equally sensitive part. I have removed a papillomatous nævus from the eyelid of a lady at the level of the lashes, without using an anæsthetic, the lady being a most interested spectator through the agency of a handglass. I mention this to show that the operation is not necessarily a very painful one. In children of an age to appreciate what is being done, the employment of a local anæsthetic may be sufficient, in some cases by inunction of oleate of cocaine (which I have not used for several years) or by ethyl chloride; but anything of a freezing nature is undesirable as it puts the parts in such a condition that they do not conduct the current as well, and it also masks your work; for these reasons I resort to it as little as possible.

We will now come to the subject proper of my paper, the electrolysis of nævus, and will consider it in its relation to the classification to which I have referred.

## NÆVUS PIGMENTOSUS.

*Nævus Spilus*.—The monopolar method is used, the needle is attached to the negative pole, and insulated where it will come in contact with the skin. To lessen the chances for scarring, having used antiseptic precautions, the growth is punctured from the lowest portion in a direction upwards, and the needle carried through the upper side of the growth. Care must be taken to keep the point of the needle below the surface of the skin, not allowing the latter to become transfixd; in the case of an infant, the inactive electrode, already described, has previously been placed upon and between the shoulders, and the infant is lying upon it; in the case of an adult this electrode is held in the hand by its uninsulated portion and applied to the other hand just before commencing operations. The current is now slowly and very carefully turned on until a slight blanching of the parts is noticed, shock is studiously avoided, and a strength of from one to five milleamperes is usually sufficient; as a rule, the less current you can do the work with, the better will be your result, the action of the current may loosen the needle so that care must be taken lest it fall out. When well loosened it may be slightly withdrawn and introduced through another portion of the growth, using the former precautions, and when all of the nævus has been subjected to the process, and is blanched, the current is turned off, the inactive electrode removed, and the needle carefully and slowly withdrawn. It is not advisable to prolong the operation beyond ten or fifteen minutes, the smaller nævi may require only a few minutes. Where little work has been done, frequent bathing of the parts with water, as warm as can be borne, will allay irritation, favor absorption and healing. Where the work has been more extensive it is well to gently cleanse the surface, dry thoroughly, and apply one or more layers of acetanilid collodion which may be renewed as often as necessary until healing is complete. Should the first operation prove insufficient to remove the disfigurement, it may be repeated as soon as healing is completed.

*Nævus Verrucosus*.—Here the growth is transfixd with the negative needle, from below upwards, at the level of the sound skin, observing the former precautions. In this case more current strength, as a rule, will be required and destruction of tissue will be more extensive; it may be necessary to mummify the whole growth; the resistance of the tissue varies much according to the amount of moisture in the growth; the drier the growth the more current will be required; but care must be exercised lest the process being carried too far, there will be a depressed cicatrix in the place of the former nævus. In this, as in all cases of nævus, experience will be the only guide, no hard and fast rule can be laid down that will be applicable to every case. One wise rule in all cases is, that it is better to do too little and repeat, than too much and repent.

*Nævus Lipomatodes*.—This likewise requires the negative needle to transfix the growth in all directions, and a current of sufficient strength to mummify.

*Nævus Pilosus*.—Each hair will require removal before the nævus proper is attacked unless, as frequently happens, the removal of the hairs causes the blanching and subsequent disappearance of the nævus. The epilation is accomplished as follows: The hair to be removed is seized with epilation forceps, and gentle traction made; a very fine needle, or "pivot broach," held in a suitable handle and connected with a negative pole, is introduced to the bottom of the follicle alongside the bulb, the indifferent electrode is held in the patient's hand generally, the current is then turned on until small



bubbles of gas are seen to issue from the seat of puncture, in time varying from a few seconds to a minute the hair will be found loosened; the indifferent electrode is then removed from the hand, the needle withdrawn and then the hair; if the follicle is seen to be adherent to the hair bulb and comes away with it, the operation has been successful, otherwise another hair will grow in that spot. If the indifferent electrode is not brought in contact with the patient's hand until the needle has been inserted into the next follicle, it will not be necessary to turn the current off and on each time a puncture is made. In some cases the needle has a device called an interrupter by means of which the circuit is made or opened while the needle is in the follicle, contact with the indifferent electrode being maintained throughout. Hairs should never be removed at one sitting which are closer than one quarter inch apart, and the operation should not be repeated until all redness due to the operation has disappeared. The parts should be bathed frequently in the interval with water hot as can be borne. If the epilation has not removed the nævus, it should be attacked when the hairs have all been successfully destroyed; the tissue below the skin may be found quite fibrous, and will be transfixed as described above. Where the interval between operations is prolonged, I generally keep the parts protected by a coating of collodion, renewed as often as it peels off.

#### NÆVUS VASCULOSUS.

*Nævus Vasculosus Simplex.*—This variety is the one most difficult to treat with success; great patience as well as great caution is necessary when the nævus is diffused in the form of a stain; it is wiser to attempt the removal of only limited portions at a time, otherwise much scarring may ensue. The negative electrode is usually a device holding a number of needles (sometimes twenty) set about a quarter inch apart with their points on a level; with this the nævus is punctured to a sufficient depth to penetrate the skin, and the current turned on until the skin begins to blanch; after about half a minute the current is again turned off and the electrode withdrawn and the parts bathed with the hot water. The effect of this treatment is to block up and destroy the capillaries which form the nævus; it should not be repeated until after an interval of about one month, when another portion of the nævus may be attacked. It should not be expected that the skin will assume a perfectly normal appearance, but much improvement should be looked for; here, again, great care is very necessary lest too much be attempted. Another method is to use a single needle as the negative electrode, and with it make a number of perpendicular punctures about a quarter inch apart. This is the method I prefer.

Where the nævus is composed of small dilated vessels which are seen ramifying on the surface, or as small prominences, the treatment is apt to be much more successful; here a single negative needle is used, we endeavor to insert the needle in the vessel, and block its lumen with the bubbles of hydrogen gas evolved and so cut off the blood-supply to the part, and current sufficient to cause this is all that is called for; several spots may, with advantage, be attacked at the one sitting, provided the current has not been excessive. The operation should not be repeated until healing is completed. A protective dressing of collodion may be advisable in the interval.

*Angioma Cavernosum.*—In this variety I usually employ both positive and negative needle, carrying the needles a short distance from and parallel to each other, transfixing the growth just at the margin of the sound skin; current sufficient to partially destroy must be used, and here once more the greatest judgment will be required. Coagulation occurs, and in order that



the thrombus may not be disturbed by the withdrawal of the needles, they should be removed with a twisting motion; the clot formed around the positive pole will be found to adhere to the needle, so that it is well to reverse the current for a few minutes (first turning it off); the bubbles of hydrogen gas liberated about what was formerly the positive pole will cause the clot to loosen, when the needle may be removed without disturbance of the clot and without causing hæmorrhage which would interfere with the success of the operation. A firm dressing of absorbent cotton and collodion is very important in these cases, renewed as often as necessary, and the operation should be repeated when all evidences of the former one have disappeared.

In many cases it will be found that there is considerable hypertrophy of the parts; here the positive needle may be employed with advantage to promote atrophy, while the negative needle transfixes or is inserted into the supply vessel in order that the bubbles of hydrogen may enter the vessel, be carried along by the blood-current and finally block up the capillaries, and so shut off the nutrition of the parts.

There is frequently a fibrous change associated with nævi that does not constitute a distinct type, although it is sometimes alluded to as such. The condition is amenable to similar treatment to that laid down above; when underlying the nævus proper, the tissue should be softened by the negative pole, absorption will thus be favored, and the material should disappear under electrolysis. A marked example of the efficacy of electrolysis, in what at first sight seemed a most hopeless case, was referred to me by Dr. J. A. Temple. It also illustrates the difference between correct and incorrect technique, as the case had the benefit of six previous electrical operations by another practitioner with little appreciable benefit. The child was one year of age; the left ear was full one-third larger than the right, and projecting. At the back of the lobe was situated an ugly, pendulous mass, while in front were three raised "strawberry marks," and a plentiful supply of very noticeably dilated capillaries. Chloroform having been administered, on careful examination I detected a spot on the back of the ear where, by pressure, I could lessen the circulation through the blemishes in front. In this I inserted a gold needle connected with the negative pole of the battery, while in the centre of the pendulous mass I inserted a similar electrode connected with the positive pole. Fifty milleamperes were used for seven minutes, and seventy-five milleamperes for eight minutes. That the negative pole had transfixed the supply vessels as intended was quite apparent, for the bubbles of hydrogen gas could be readily seen meandering through the dilated vessels in front and along the "strawberry spots." On turning off the current the needles were carefully withdrawn, and oozing controlled by pressure with iodoform-dusted pads. The sites of the puncture were then coated with iodoform collodion, which was renewed subsequently as often as necessary. The effect in this case was steady and progressive; the spots gradually paled; the pendulous mass atrophied; the hypertrophy of the ear became less apparent, and the ear less projecting. No other interference was necessary, and to-day, the other ear having developed with age, there is little difference between them, certainly not sufficient to constitute a deformity. The case was treated June, 1893, and the above report was written in August, 1895. The case is cited at length as it presents many interesting features, and illustrates the indications for use of the respective poles. (It will be noticed that gold needles were employed. I now use irido-platinum ones.) In April, 1892, I operated upon a case referred to me by Dr. G. S. Ryerson. The child was eight months of age and had a very disfiguring vascular projecting nævus the size of a small bean on the left upper eyelid,

and extending behind the orbit. Under chloroform anæsthesia, a negative needle was inserted in the growth on the eyelid, and carried in all directions through the nævus, using five milleampères for forty-five minutes. In July of the same year I employed a negative needle again to complete the blanching of the nævus, at this time using merely one milleampere for fifteen minutes. Last August I received from her father a photograph of the child, recently taken, in which not a trace of a nævus is to be seen. These two cases were each practically cured in one treatment (in the second case there was very little sign of nævus left after the first operation, and that little would have most probably disappeared in a short time without further interference, but the father was a physician and wished the second treatment.) The cases will represent what may be accomplished with electrolysis in treating nævus situated on such parts and of such extent that the use of the knife would be out of the question, and the employment of other means very hazardous; they also show the advantage of early operation; each, if left alone for a short time, would have no doubt resulted in deformities that would necessitate much more prolonged measures, with indifferent results, perhaps. But where a case has been allowed to go on until the person has reached years of maturity, and great disfigurement has occurred as a result, we may still accomplish much by electrolysis if patience and great care be exercised. In illustration of this, I submit the following instance: A young man of nineteen years of age was referred by his physicians for the removal of a very vascular nævus on the right upper lid, which had been there since birth; it was one and a quarter inches long and three-quarters of an inch across; the upper overhung the lower lid, the lower tarsal cartilage was atrophied and the eye almost closed from pressure by the hypertrophied upper lid; the nævus also extended for a short distance beyond the outer canthus, and there was a growth beneath the palpebral conjunctiva about three-eighths of an inch long, a quarter of an inch across, and about one-eighth of an inch in thickness; over this the conjunctiva was very vascular. On this case I operated six times in 1895, and three times in 1896, each time, except the first, under an anæsthetic; the affected eye can now be opened as widely as the other, and the atrophied cartilage was increasing in thickness when I last saw the case over a year ago. His physician wrote me in July, 1897: "There is still a varicose area on the upper lid and a little at the outer angle of the eye, but it is not at all increasing in size, and the result, as it is now, is to my mind most satisfactory," etc. The patient lives at some distance from Toronto, so that I am unable to say whether all traces of the nævus have disappeared by this time; but I have no doubt that any disfigurement which may remain could be removed by similar means to those outlined above. Many more cases might be cited in support of the claim for electrolysis in nævus, but time does not permit, and those above are fair samples of what may be accomplished by this means when proper precautions are taken and due judgment exercised.